

AFIT/GMO/LAL/98J-8

**THE NEWEST SEAMLESS AIRLIFTER:
THE C-130J-30**

GRADUATE RESEARCH PAPER

Douglas L. Haven, Major, USAF

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THE C-130J-30**

GRADUATE RESEARCH PAPER

Presented to the Faculty of the Graduate School of Logistics
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Requirements for the Degree of
Master of Mobility

Douglas L. Haven, B.S., M.S.

Major, USAF

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Douglas L. Haven

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Abstract

The end of the Cold War has had a dramatic effect on America's national security strategy. As the peace dividend continues to yield defense cuts and force reductions throughout the world, we have moved from a forward presence force to a force projection force. Airlift is vital as a first response to any action that requires an American presence. Whether it involves airlifting supplies and personnel into Bosnia in support of IFOR or enforcing sanctions on Iraq, adherence to AMC's Core Competency of Global Reach will continue to place demands on our airlift resources. This demand must be met with a well thought-out employment strategy for all of AMC's airlift assets. The harsh reality is that in the future our airlift assets will experience shortfalls in capability, creating challenges for any transportation system we build. These challenges will force us to develop innovative ways to employ these assets if we hope to meet the demands of projecting those forces anywhere in the world.

One airlift asset that will expand our employment options is the next generation Hercules, the C-130J-30. The J-30 is destined to become a part of the airlift picture in the near future and evaluations are under way on how to best utilize it. Should the USAF employ it purely in its traditional intratheater role, or expand it into the intertheater role? This paper looks at the difference between these roles, examines the traditional role of the C-130, and how this has shaped the way we do business today.

THE NEW SEAMLESS AIRLIFTER:

THE C-130J-30

I. Introduction

Background

Strategic airlift has long been the domain of large transport aircraft capable of transporting large quantities of military equipment, supplies, or personnel over long distances. The workhorses of these missions have been the C-5 Galaxy, the C-141 Starlifter, and more recently, the C-17 Globemaster III, while the bread and butter of their smaller, slower cousin, the C-130 Hercules, has been the theater/tactical airlift mission. However, the demise of the Soviet Union and the end of the Cold War have resulted in a significant drawdown in defense personnel. Although this force reduction was necessary and probably long overdue, it has placed a strain on remaining personnel and scarce resources. This is especially true with today's worldwide commitments. Whether it involves airlifting of supplies and personnel for peacekeeping duties in Bosnia, or long deployments in the Persian Gulf to enforce the Gulf War sanctions, our strategic airlift assets have been pushed to the brink.

The future looks even dimmer with respect to the eventual phase-out of 266 C-141 aircraft and the subsequent procurement of a mere 120 C-17s. No matter how you

look at it, this is an inadequate tradeoff. Even with the Globemaster III's greater cargo capacity, a shortfall still exists in what General Kross, AMC/CC, referred to as "tails, tails, tails" (11). The impact of this lack of tails is that there are not enough aircraft to fly Air Mobility Command's (AMC's) airlift missions. This shortage of tails is nowhere near as critical in peacetime as it will be in wartime.

As mentioned earlier, the C-130 has been used primarily by the United States Air Force for theater airlift. However, many other allied Air Forces use the C-130 as their primary strategic airlifter, including the Royal Air Force (RAF), and the Royal Australian Air Force (RAAF). They have already committed to purchase the next generation Hercules, the C-130J, to continue service as the backbone of their strategic and tactical airlift needs. The US Congress has also committed to purchase this advanced airlifter.

Problem Statement

The J-30 is destined to become a part of the airlift picture in the near future and evaluations are under way on how to best utilize it. Should the USAF employ it purely in its traditional intratheater role, or expand it into the intertheater role? This paper looks at the difference between these roles, examines the traditional role of the C-130, and how this has shaped the way we do business today. It also looks at Air Force Doctrine and the critical role it plays in implementation of United States' national security policy. A historical perspective of C-130 employment will demonstrate the C-130's versatility in either arena. Finally, a look at direct delivery will expand the possibilities for J-30 employment. The primary problem addressed in this paper is, now that the USAF will be

accepting the J-30 into its inventory, what is the best way to employ this weapon system?

To answer this question this paper will look at the following investigative options:

Option 1. What is the impact if the J-30 is employed in the traditional C-130 role as an intratheater airlifter?

Option 2. What is the impact if the J-30 is employed as an intertheater airlifter to augment our strategic airlift assets?

Option 3. What is the impact if the J-30 is employed in a dual or mixed role as both an intertheater and intratheater airlifter?

II. Literature Review

Introduction

In order to fully understand the capabilities and the possibilities that the J-Model represents, a brief discussion of airlift is necessary. Following is an analysis of the difference between strategic (intertheater) and tactical (intratheater) airlift. This necessitates a look into Air Force Doctrine with an in-depth look at the importance placed on airlift capability as it relates to national security. An understanding of projected airlift requirements, as spelled out in the Mobility Requirements Study Bottom-Up Review Update (MRS BURU), versus projected capabilities, will help show where our projected shortfalls are. With airlift recognized as a key element to our national security, we can ill-afford to have limits on our capability. This is why we must look at the J-30 as a way to fill the gaps in our intertheater airlift capabilities.

After looking at airlift doctrine, a brief history of the C-130's contributions to our transportation needs since its inception will help lay the groundwork for evaluating its potential employment to shore up our intertheater assets. It will also identify the existing paradigms about the C-130's use, and why those will need to change before being used to its full potential. This will include a quick study of how other C-130 users operate the Hercules as their major source of both tactical and strategic airlift. The history of the Hercules will involve a study of the development and acquisition of the J-Model, and more importantly, for the purposes of this discussion, the stretch version C-130J-30.

An air refuelable J-30 has the potential to expand AMC's direct delivery capability, the ability to deliver combat personnel, equipment, and supplies, from staging bases in the Continental United States (CONUS) directly to the Forward Operating Base (FOB). The ability to perform this airlift concept anywhere in the world was realized with the C-17's introduction into the airlift flow. To pass the test for direct delivery, the J-30 must be compared with America's premier airlifter, the C-17. This comparison will help demonstrate what the J-30 offers and its possible shortcomings.

Although against the best advice and wishes of Air Force leadership, Congress has decided to acquire the latest generation C-130. In 1997 General Fogleman told the Senate Armed Services Committee that the Air Force had a surplus of capacity in the C-130 fleet (17:22). In August of that same year General Kross complained that Congress was pushing too many C-130Js onto the Air Force (18:32). With the introduction of the C-130J into the inventory a foregone conclusion, we have an opportunity to mold and define the future of this advanced airlifter. With Air Force doctrine continually changing, AMC has a perfect opportunity to include the C-130J-30 in its future airlift picture. With the C-130 a proven performer, the increased capability of the J-30 should extend the life of the Hercules well into the 21st Century.

Discussing the different airlift roles and the C-130's historical contributions will help address the issues in *Option 1*, the impact of employing the J-30 in the traditional C-130 role. Analysis of forecast shortfalls in strategic airlift will help analyze *Option 2*, employment of the J-30 as an intertheater airlifter. Doctrine, direct delivery, and

historical, non-traditional employment of the C-130 will help provide insight into *Option*
3, mixed employment of the J-30.

III. Seamless Airlift Doctrine

In the past there existed an invisible seam between the intertheater and intratheater flow. This seam represents the temporary disruption in the flow of personnel, supplies, or equipment from the intertheater assets to the intratheater transportation asset, be it land, air, or sea. This is a focus on the seam between the air assets involved in the flow. On the intertheater side of the airlift seam lived our large strategic airlift assets while on the intratheater side lived our primary tactical transport aircraft, the C-130. Only recently, with the C-17, have we been able to perform seamless delivery. An analysis of strategic and tactical airlift, along with a brief look at airlift doctrine, will help introduce the J-30 as the new seamless airlifter.

Airlift is the movement of goods and people to where they are needed, when they are needed there. The worldwide orientation of American foreign policy, the numerous threats to free world interests, and the speed and complexity of modern warfare have combined with political and resource constraints to produce today's airlift doctrine and force structure. Brig Gen John C. Fryer, Jr. (19:vii)

These words are as pertinent today as they were when they were published in March 1988. Because it is a blueprint for commanders of how to plan and execute the Air Force mission, Air Force Doctrine is becoming more important now than ever before, and the value placed on airlift to the shaping and implementation of this doctrine grows in importance as well. According to Air Force Doctrine Document 1, airlift is discussed as follows:

Airlift is the transportation of personnel and materiel through the air and can be applied across the entire range of military operations in support of national objectives. Airlift provides rapid and flexible options allowing

military forces to respond to, and operate in, a wider variety of circumstances and time frames. A key function of the Air Force, airlift provides global reach for US military forces and the capability to quickly apply strategic global power to various crisis situations worldwide by delivering necessary forces. The power-projection capability that airlift supplies is vital since it provides the flexibility to get rapid-reaction forces to the point of a crisis with minimum delay. Accordingly, **airlift is viewed as a foundation of US national security at the strategic level and as a crucial capability for operational commanders within a theater.** (8:54)

This statement shows how vital airlift is to meeting our national objectives. Airlift is viewed as an important asset in our national security strategy and cannot be overlooked.

Airlift is the backbone of deterrence. A properly structured and equipped airlift force is critical to the successful execution of the national military strategy. How we think about airlift and how we translate those thoughts into meaningful expression of how to develop, deploy, and employ airlift forces is vital to the national defense. Fryer (19:viii)

From D-Day to the Berlin airlift to Vietnam to Desert Shield/Storm, airlift has played a vital role in meeting specific national goals during critical wartime and peacetime operations. The importance of airlift is reinforced further through one of the Air Force's Core Competencies, Rapid Global Mobility. In this day of drawdowns and military cutbacks, we now do with airlift what we once did with forward presence, evolving into a forward projection force. With American forces in Europe at one-third the level they were during the Cold War, and worldwide force reductions, the only way to project forces anywhere in the world is through airlift. This ability to pack up and move a formidable force to anywhere in the world is more important now than ever before, as recent world events have proven.

Our ability to quickly deploy and mass a force to contain Saddam Hussein during the Persian Gulf crisis continues to bring recognition and respect from our supporters and adversaries alike. No other military in the world today has the speed and expertise to launch the necessary forces and fresh water-producing equipment into Goma, Zaire to halt the cholera epidemic and save 2500 lives a day (4). Without airlift, speedy placement of critical personnel and equipment needed to institute the peace process in Bosnia would have been delayed due to lack of infrastructure. The war-torn country lacked the road, rail, and bridge networks necessary to execute the provisions of the Dayton Peace Accords. Airlift preserved the implementation of the peace process, preventing further bloodshed. As these events demonstrate, without adequate airlift assets, we would not be able to contain aggression, stem the tide of death and disease, or implement international peace agreements.

Doctrine states that airlift has three basic classifications, strategic (intertheater), theater or tactical (intratheater), and operational support. For the purposes of this discussion, focus will center on the first two categories. Air Force Doctrine states that these classifications are not distinguished by the assets performing the missions, but by the missions themselves.

Strategic Airlift

Intertheater airlift provides the air bridge that links theaters to the CONUS and to other theaters, as well as airlift within the CONUS. The forces responsible for executing intertheater airlift missions are under the combatant command of the Commander in Chief, US Transportation Command (USCINCTRANS). Due to the global ranges usually involved, intertheater airlift is normally composed of the heavy, longer range,

intercontinental airlift assets, **but may be augmented with shorter-range aircraft when required. (8:55)**

The last sentence refers specifically to an aircraft with the C-130's capabilities. Although not considered a long-range heavy hauler, along the same lines as the C-17, the C-141, or the daunting C-5, the C-130 is commonly used for intercontinental transport. Even though intratheater airlift has been the traditional domain of the United States Air Force (USAF) C-130 fleet, other countries operate the C-130 for intertheater airlift as well.

The RAAF regularly flies their C-130s on strategic missions to places like Southeast Asia, the US, Canada, and Great Britain. Even the USAF employs the C-130 for intertheater transport on positioning legs for overseas deployments in Saudi Arabia, Europe, and other areas within Southwest Asia. In Asia and Southeast Asia the C-130 provides a vital air-bridge linking American forces and allies throughout the region. During Desert Shield/Storm, the 17th Tactical Airlift Squadron (TAS) deployed from Elmendorf AFB, AK to Hickam AFB, HI to fill the gap left when the larger transports were pulled out of theater for operations to the Persian Gulf. For the duration of the conflict the strategic "Coral Run" missions to Wake Island, Kwajalein, Johnston Atoll, and Midway Island were performed flawlessly by the Alaskan C-130s.

Strategic Shortfalls

Warfighting models used by the MRS BURU to set cargo airlift requirements at 49.7 million ton miles per day (MTM/D), in response to our national security strategy of being able to support two nearly simultaneous Major Theater Wars (MTW), helped

establish an airlift requirement for 120 C-17s (12:vii). Although the C-17 represents an increase in capacity over the C-141, it will not come on line fast enough to overcome the loss of capacity brought on by the C-141 retirement until approximately 2003. Figure 1 represents this shortage through the unfilled portion of the bathtub. The bathtub also shows the heavy reliance on CRAF assets to achieve the MRS BURU requirements (12:29).

However, one problem that this graphic does not represent is dramatic reduction in AMC's strategic airlift assets with the C-141/C-17 tradeoff. This will reduce our ability to respond to multiple global mission taskings. It will also place an increased burden on our remaining C-17 and C-5 resources. General Kross's comments articulate this problem best:

With 266 C-141s retiring to be replaced by only 120 C-17s, every individual airframe becomes more critical to our airlift needs. The loss of 146 total tails represents a significant loss in global flexibility to respond to multiple mission taskings. (12:vii)

This loss of global flexibility is as much a peacetime limitation as it is a wartime one. The reduction of airframes places day-to-day taskings at risk, not to mention the potential turmoil caused every time Saddam Hussein steps out of line, or the additional strain a Bosnia or Somalia puts on our stretched airlift resources.

STRATEGIC AIRLIFT CAPACITY FY 97-03 CRAF = 20.5 MTM/D

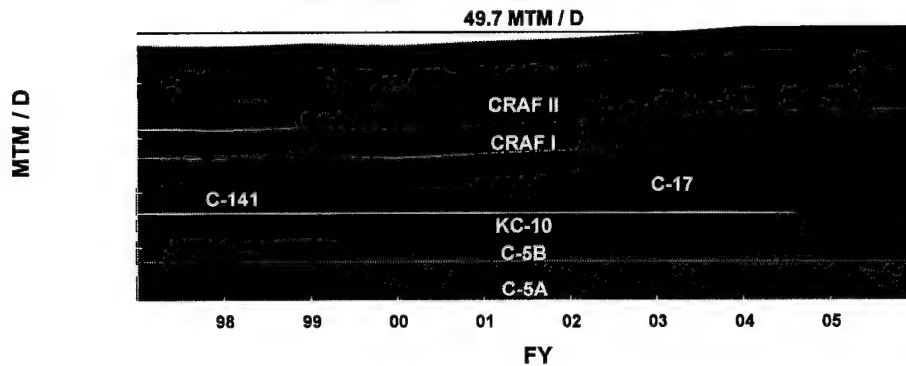


Figure 1. Bathtub Representation of Strategic Airlift Capacity (12:29)

Tactical/Theater Airlift

Intratheater airlift provides the air movement of personnel and materiel within a CINC's area of responsibility. Assets designated to provide intratheater airlift are either assigned or attached to that geographic CINC. This classification of airlift is generally fulfilled by aircraft capable of operation under a wide range of tactical conditions, including small, austere, unimproved airfield operations. (8:55)

The C-130 was tailor-made for this mission. This definition also contributed in part to the development and employment of the C-17, but prior to its introduction, this was the domain of the C-130. Today, the C-130 is still the workhorse of the theater airlift environment. This is due to the high operations tempo of the C-17 force in the intertheater role and the large number of C-130s available for the intratheater missions.

This also creates problems with the intratheater airlift concept of operations, since

the theater CINC relies to a great extent on having control of those airlift assets. Theater assets are normally under the operational control of the theater commander. When assets deploy to operate in a contingency in a theater, they normally undergo a change of operational control (CHOP) under the theater commander. Because the C-17 is considered an intertheater asset, the C-17s are not normally CHOPed. According to General Kross, the C-17 will never chop (14). However, during Operation JOINT ENDEAVOR, which involved the delivery of the Implementation Forces (IFOR) into Bosnia, the C-17 changed tactical control (2). Because the theater CINC relies heavily on the theater assigned or chopped C-130 assets to control intratheater airlift operations, there is great reluctance to support any policy that could limit this control.

As will be discussed later in greater detail, the C-17 is the centerpiece of the innovative concept of operations introduced earlier, direct delivery. Direct delivery's ability to overcome the seam between strategic and tactical airlift may well change the way we look at the separation between intertheater and intratheater airlift. With the C-17's range of approximately 2400 nautical miles, this would be a limited capability without an air-refueling capability (7). The J-30 has an even greater unrefuelable range of 3000 nautical miles (15). Add to this longer range an aerial refueling capability and you have the makings of the next seamless airlifter.

IV. History of the C-130

A Proud Airlifter

Having looked at two distinct theaters of airlift, a brief look at the C-130's traditional role will introduce the paradigms that must be overcome in order to fully utilize the J-30. When the Air Force took delivery of the first C-130 on 9 December 1956, it marked the introduction of a valuable asset that would form the backbone of tactical airlift. That A-model would be the first operational Hercules of over 2100 C-130s delivered worldwide by Lockheed-Martin (16).

Early on in its career, the C-130 was employed in a series of intertheater, direct delivery missions. Beginning with the Middle East crisis in 1958, the Hercules experienced a series of operational tests. During the summer of 1958, 100 C-130s were involved in airlift of personnel and supplies from Europe and the United States to Beirut and Turkey to halt the threat of Communist takeover in Lebanon. In eleven days they airlifted 8 million pounds of cargo and equipment along with 5,870 personnel (9:142).

In 36 short hours, C-130s performed feats of speed, range and payload never before possible in military airlift missions. (9:140)

That same year, a major crisis in the Taiwan Straits between mainland China and Taiwan would call the C-130 into action on the other side of the world. The quick response of the C-130's hauling in the bulk of the needed armaments, maintenance and support personnel would allow for the swift mobilization of the composite strike force that would prevent an escalation of the conflict into a shooting war. Throughout the early 1960s the C-130 would make its mark worldwide, from transport of United Nations

forces and aid into the Republic of Congo, to flying the Hump in India to sustain Indian troops battling Communist Chinese invaders. However, it would be the C-130's performance during the Vietnam conflict that would solidify its role as the USAF's premier combat airlifter, with a peak of 72 Hercules assigned to the theater of operations at one time (9:144).

Designed as a long-range medium sized transport aircraft, the Hercules is known for its short-field takeoff and landing capability on unimproved airstrips and has the ability to operate in harsh, demanding environments. For years the US Navy has operated their C-130s in Antarctica, landing on runways of ice for Operation Deep Freeze. The USAF and the Canadian Air Force (CAF) have used the C-130 to transport badly needed supplies to radar sites along the Defense Early Warning (DEW) Line, flying into numerous hazardous one-way sites, with short, steep sloping gravel covered runways that turn to ice during the long, cold winters. In contrast, the RAAF operates their C-130s in the hot, humid, mountainous one-way strips in the Central Highlands of Papua New Guinea. Operated by over 60 countries, for both commercial and military transport of personnel and equipment, the C-130 continues to be an important piece of the airlift puzzle.

Why the J-Model?

With the C-130 already a proven transporter worldwide, why should the USAF switch to the J-Model? As discussed earlier, Lockheed delivered its first C-130 in 1956 and has delivered them nearly annually since then. Even though the A and B models

have long since been retired, the age of the C-130 fleet is of grave concern. Of the 524 combat delivery C-130s in the inventory, including Active Duty, Guard, and Reserve, 54 percent are over 23 years old, and 45 percent are over 33 years old. Added to the concern over this aging fleet is the lack of homogeneity within the C-130 force, with seven different mission design series (MDS) in the mix (See Figure 2) (1:6-7).

This difference in configuration impacts the operational mission. A crewmember qualified in the C-130E is not automatically qualified to fly the C-130H3 because they are considered completely different weapon systems. These two aircraft also require different maintenance packages or MSRP kits, along with unique support equipment. These differences can wreak havoc on a contingency of mixed squadrons and tie the theater CINC's hands, restricting scheduling options, and creating operational constraints. Today, two C-130 squadrons can deploy from the same base and not operate interchangeably. For example the 50th Air Lift Squadron (ALS) with C-130H3s and the 61st ALS with C-130Es, both out of Little Rock AFB, cannot inter-fly or provide interchangeable maintenance support between the two squadrons.

COMBAT DELIVERY CONFIGURATIONS

MODEL (TOTAL #)	C-130E (188)	C-130EA (50)	C-130C (3)	C-130H1 (15)	C-130H2 (159)	C-130H3 (80)	C-130J (8)
ENGINE	T-56-A-7	T-56-A-7	T-56-A-15	T-56-A-15	T-56-A-15	T-56-A-15	AE-2100
AUX POWER	GTC/ATM	GTC/ATM	GTC/ATM	APU	APU	APU	IMPROVED APU
COMPASS SYSTEM	C-12 or N-1	C-12	C-12	C-12	C-12	C-12 or DUAL INU	DUAL EGI
IFF	APX-72	APX-72	APX-72	APX-72	APX-72	APX-100	APX-100
AUTOPILOT	E-4	E-4	E-4	E-4	AP-105	AP-105	DIGITAL AP W/ AUTO- THROTTLE
FLIGHT DIRECTOR	RO-610 SCNS	RO-610 SCNS	RO-610 SCNS	RO-610 SCNS	FD-109 SCNS	FD-109 SCNS	DUAL MISSION COMPTRS
RADAR	APN-59	APQ-175	APN-59	APN-59	APN-59 or APN-241	APN-241	APN-241
GCAS	NO	NO	NO	NO	YES	YES	YES
TCAS	NO	NO	NO	NO	NO	YES	YES
NVIS	NO	NO	NO	NO	NO	YES	YES
CREW	5 or 6	5 or 6	5 or 6	5 or 6	5 or 6	5 or 6	3

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Figure 2. Different Combat Delivery C-130 Combinations (1:7)

Even with the concerns addressed above, the current C-130 fleet has a projected service life early into the next century. Former Air Force Chief of Staff, Retired General Ronald R. Fogleman, told the Senate Armed Services Committee that the current C-130 fleet would meet Air Force needs until 200 (17:22). However, with 2005 fast approaching, MAF/CC General Kross commissioned a C-130 Tiger Team to develop an integrated solution to improve the condition of the C-130 weapon system across the board. The Tiger Team's purpose was to obtain Chief of Staff of the Air Force (CSAF) and Secretary of the Air Force (SECAF) approval and agreement on a long-term, success oriented strategy for the C-130 weapon system. The Tiger Team presented two major

recommendations. First, they suggested replacing the oldest, least reliable E-Models with 150 C-130J-30. Second, they proposed a Service Life Extension Program (SLEP) with dramatic modifications to the remainder of the fleet to create a second MDS known as the 'X'-Model, which will be discussed later. Their justification for this decision is broken down into four factors depicted in Figure 3 (1:27).

J-30 Acquisition Factors

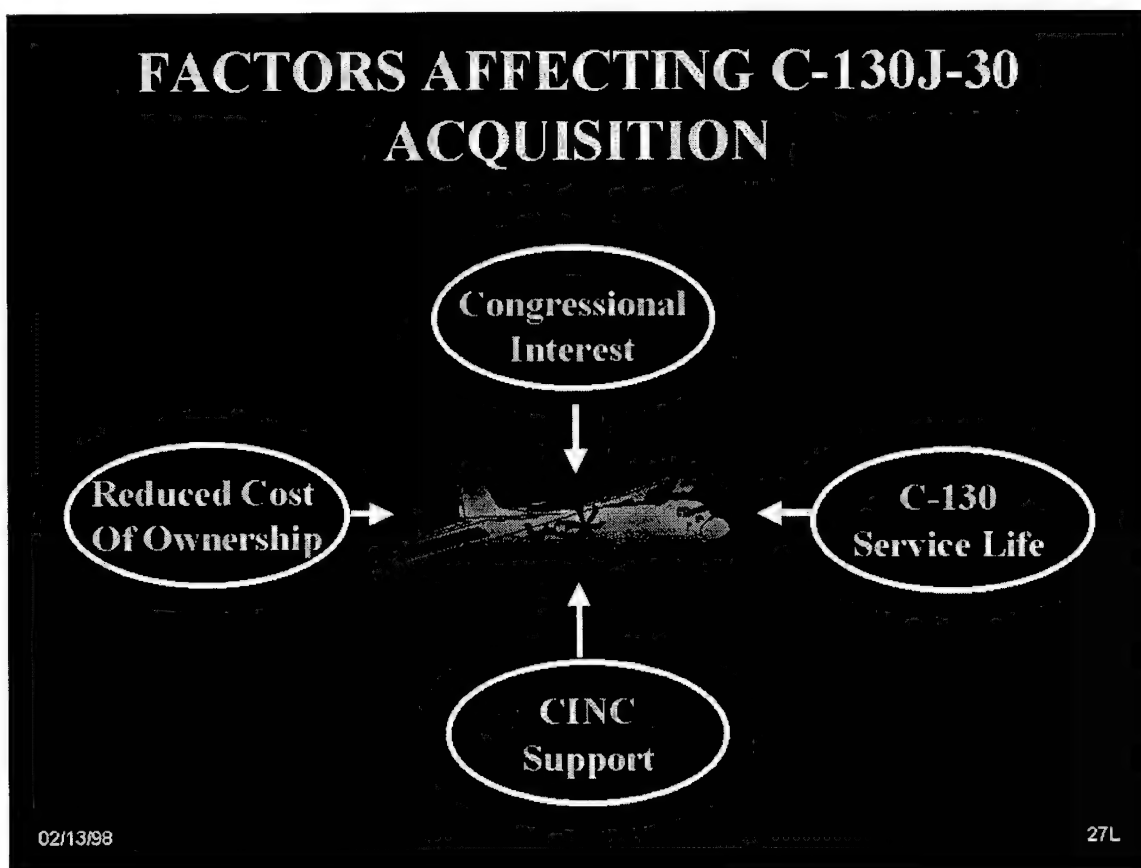


Figure 3. Factors affecting C-130J-30 acquisition (1:27)

Congressional Interest.

One undeniable factor affecting J-30 acquisition is Congressional interest. The Tiger Team was instructed by the MAF/CC to base their recommendations on political realities. As addressed earlier, Congress has already funded the purchase of the J-Model. As a matter of fact, instead of the single J requested by the DOD (Defense of Defense), Congress added \$300 million to the 1998 defense-appropriations bill to boost that number to seven (18:32). With Senator Trent Lott, R-Mississippi, and Speaker of the House Newt Gingrich, R- Georgia heading up efforts to purchase the J-Model, the Tiger Team recognized the futility of resisting J-Model acquisition. While Senator Gingrich's home district is where the J-Model is produced, Senator Lott's home district just happens to be where the first two J's are slated for delivery. Analysis of historic acquisition trends of the C-130 for the Air National Guard (ANG) and Air Force Reserve (AFRES) are directly linked to Congressional action since 1978 (See Figure 3). The shaded areas represent different variants of the C-130. The J-Model appears in years 94 and 96 through 98. The ANG and AFRES have historically relied on Congressional add-ons for equipment upgrades, and the C-130 is a prime example of how this system operates.

For the past 21 years, with the exception of five aircraft, Congress has directed the procurement of C-130s for the Air National Guard and Air Force Reserve units. According to C-130 program officials, the Air Force has not requested these aircraft because aircraft in those units have many years of service life remaining. (23:6)

CONGRESSIONAL INTEREST

- Congress Has Added 260 C-130s To The Air Force Budget Since 1978
 - Averages Over 12 Aircraft Per Year

Congressionally Added C-130s Since 1978

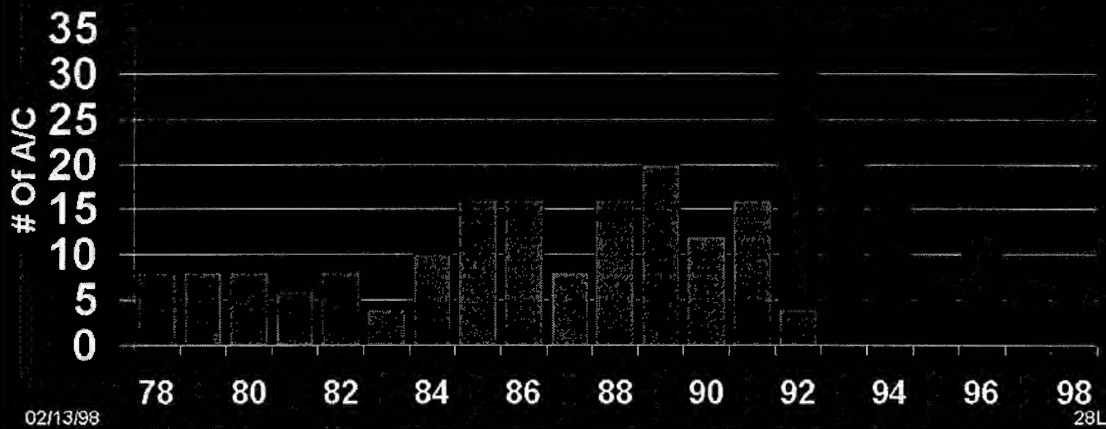


Figure 4. Congressional Influence on C-130 Acquisition (1:28)

With Guard and Reserve units scattered throughout the 50 states, it is virtually impossible to kill these add-ons once they have been put in. Some political pundits predicted President Clinton would use his line-item veto authority to strike down the money budgeted by Congress in the Defense appropriations bill for the C-130J. However, President Clinton, still smarting over Congressional outrage from his cuts to the 1998 Military Construction bill, spared the J-Model (3:2557).

C-130 Service Life.

With Congressional Interest playing an important role in the C-130J's survival, the Tiger Team accepted the political realities of the situation and examined the remaining factors effecting J-Model acquisition. The second most pressing factor impacting their recommendation was C-130 service life of the current fleet of aircraft. With a large portion of those C-130Es around 35 years old, those with the worst service life problems will be retiring soon. In 1997 General Fogleman told the Senate Armed Services Committee that 50 to 60 C-130s would be retired in the next few years. Although General Fogleman did not voice a need to replace these immediately, the Tiger Team seized the opportunity presented by Congress to substitute the oldest C-130s with some J-Models.

Reduced Cost of Ownership.

The third main factor of Projected Reduced Cost of Ownership is a counter to the second factor, Service Life. History has proven that as airplanes grow older, the cost of maintaining them and extending their service life increases. This is certainly true for the C-130 fleet. Projected costs of ownership are expected to escalate with respect to a service life extension plan (SLEP), corrosion repair, and structural repair. Costs are on the upswing in maintaining and supporting equipment over 25 years old, such as the E and H model T-56-A-7 and T-56-A-15 engines. The -7 has been out of production for 25 years and parts availability is rapidly diminishing. The MTBF (Mean Time Between Failures) of the APN-59 Radar is at 50 hours while the 25 year old auto pilot, which relies on

outdated tube technology, is at 15 hours. These rates are not just costly, they reduce C-130 operational capability and strain an already overworked maintenance system. Acquisition of the J-Model is one step toward reducing the cost of ownership (1).

The second step, introduced earlier, is a SLEP designed to eliminate the weakest, oldest systems on the remaining E, H1, and H2 aircraft. The newly designated 'X'-model will probably most closely resemble the H3, with a glass cockpit and advanced instrumentation. Engine and computer upgrades, radar changes, and safety equipment improvements mandated after the T-43 Crash at Dubrovnik will address the 7-MDS fleet problem, reducing this number to two. In addition to these changes, the entire fleet will be able to meet the stringent navigation requirements of Global Air Traffic Management (GATM) (1:66).

CINC Support.

The fourth factor or link in the J-Model acquisition chain is CINC support. Air Force leadership has accepted the political realities that have brought about J-Model acquisition. The next step will be to design doctrine and a support structure around the J-30. The fact that the CINC threw its support behind the Tiger Team demonstrates commitment toward a plan that will address the shortcomings of our existing C-130 force. The Tiger Team brief is now the MAF/CC's game plan for propelling the C-130 fleet into the 21st Century. This is what General Kross had to say under the Commander's Intent in the 1998 Air

Mobility Master Plan (AMMP) about the Tiger Team and its plans for the future of the C-130:

We heartily welcome the C-130 fleet personnel back into AMC. The C-130 represents the cutting edge of our combat delivery mission ... Additionally, I have convened a Tiger Team that is doing a first-of-its-kind, top-to-bottom scrub of C-130 requirements, operations, training, configuration, and equipping of the fleet. This Tiger Team includes participation from all mobility air forces and will enable us to not only assess the status of the fleet but also provide a coherent modernization strategy. (12:CI)

All factors considered, a unified approach by Congress and Air Force leadership ensures that the J-30 will play an integral part of airlift in the future. Now is the time to address the paradigms of traditional C-130 employment and create a new, more innovative operating environment for the J-30,

V. What is Direct Delivery?

Traditional Delivery

The airlift mission is to deliver personnel, equipment, and supplies on-time anywhere in the world. This is the basis for airlifts' Core Competency of Rapid Global Mobility. The traditional method of worldwide airlift under this concept has been a blend of strategic and tactical airlift assets operating in the "hub-and-spoke" process. Under this concept, strategic airlifters like the C-5, C-141, KC-10, and CRAF aircraft, conduct the intertheater portion, picking up cargo and personnel at their CONUS Aerial Port of Embarkation (APOE) and delivering them to an intermediate staging location known as an Aerial Port of Debarkation (APOD). At the APOD, or "hub", the cargo would be downloaded for temporary storage awaiting delivery, or transferred to other modes of transportation for delivery via the "spokes" of the system. This is where the intratheater or tactical airlift assets like the C-130 come into play, flying multiple sorties to deliver the necessary personnel and cargo to the forward operating locations (FOLs). This also necessitates the use of alternate land or sea routes for transport of oversized cargo or large Army equipment such as the Army's M1-A1 main battle tank.

New Delivery Doctrine

The concept of direct delivery was made more feasible by the introduction of the C-17 into the airlift flow. In many circumstances the J-30 could provide the same opportunities to direct delivery implementation. Under the doctrine of direct delivery, the hub is bypassed, eliminating the need for the intermediate staging base or MOB (Main

Operating Base). This also negates the need for the transportation spokes that flow out of it, eliminating the need for intratheater transport. This concept is a necessity for today's Air Force with our dramatic reduction in assets and resources. Now, instead of multiple aircraft and additional maintenance and support resources required to handle the flow, we only need a refueling capability somewhere down track to maintain the direct delivery flow.

This is not a new concept, or even a very radical one, but something that has been practiced or desired since airlift began. However, for proper implementation of this concept, the aircraft conducting such missions must be capable of operating in restrictive, harsh environments with little or no support. What makes direct delivery possible is not only a paradigm shift in operating practices, but also a change in aircraft design.

If properly designed, an airlifter will be air refuelable and able to deliver its cargo or troops by airdrop, extraction, or airlanding modes. (19:404)

When the Secretary of the Air Force first supported acquisition of the C-17 in the Airlift Master Plan presented to Congress in the early 1980s, he articulated the importance of the correct aircraft for direct delivery. Direct delivery doctrine is founded in well established tenets of air power: speed and flexibility. This doctrine is made possible by numerous features available in a single aircraft design.

- The aircraft should be capable of carrying all of the kinds of equipment and supplies to project and sustain combat forces during the early days of a conflict.
- The aircraft should be able to deliver substantial loads over intercontinental ranges and be air refuelable.

- The aircraft should be able to deliver its cargo by airlanding, airdropping, and/or extraction.
- The aircraft should be designed to survive in a hostile environment.
- The aircraft should be compatible with the airfields that best support combat forces in the objective area. (19:404)

The feeling at the time of this expression was that while the US had airlift aircraft that could meet some of these requirements individually, there was none in the inventory capable of meeting all of these mission requirements. This lack of airlift technology delayed implementation of direct delivery, and therefore was not supported in any existing airlift doctrine.

However, with a few minor modifications, the USAF already possessed an aircraft capable of performing direct delivery. The C-130, as described earlier, was proven capable of supporting front-line forces through airland, airdrop, and extraction, as demonstrated during the critical days at Khe Sanh. The Hercules is also a proven combat survivable aircraft, with numerous accounts of heroic flights of bullet riddled airplanes, from places like Vietnam, Panama, and Peru. It has a remarkable ability to sustain combat forces and is the most versatile airframe in our inventory, capable of air refueling helicopters, airdropping 15,000 pound bombs to create landing pads, or acting as an airborne command post or search and rescue coordination center.

The traditional C-130 has three drawbacks in its ability to wholly support the doctrine of direct delivery. First, it has a relatively small cargo carrying capacity. With a maximum payload of 40,000 pounds during peacetime operations, it lacks the ability to carry substantial loads over intercontinental ranges. Second, the basic C-130 lacks A/R

capability, limiting its range and forcing it to operate in the more traditional role as an intratheater transporter. However, many Special Operations C-130s have been modified for Air Refueling to allow for direct delivery of special forces and their equipment into austere locations without airlanding enroute and possibly compromising the mission. Similarly, the RAF added an aerial refueling capability to their C-130s during the Falklands War in order to cover the necessary intercontinental distance, proving that the C-130 is capable of supporting this doctrine. Finally, the C-130 lacks the ability to carry all kinds of equipment, primarily outsized cargo, in order to project and sustain combat forces. This is one aspect of the doctrine that the C-130J-30 will be unable to overcome, along with the requirement to haul substantial loads. Even though the J-30 provides two additional pallet positions over the basic C-130J, the maximum payload weight actually goes down slightly figuring in the additional weight of the fuselage plug inserted to stretch the airframe (15). Traditionally this has not been a problem because airlift assets normally volume out before they gross out. For this reason, the additional cargo space far outweighs the minimal loss in maximum payload.

Addressing the other concerns, the J-30 is well suited for the direct delivery role. With its historically proven ability to land on short, unimproved airstrips, it makes even the most inhospitable parts of the world accessible. For those areas where runways are non-existent, the C-130 provides a wide array of airdrop scenarios, able to airdrop all but the Army's largest equipment. As will be seen later, the J-30 provides superior personnel airdrop/airland capability over the C-17. This capability makes it a likely candidate for strategic brigade airdrop (SBA), relieving the need for the C-17 to perform personnel

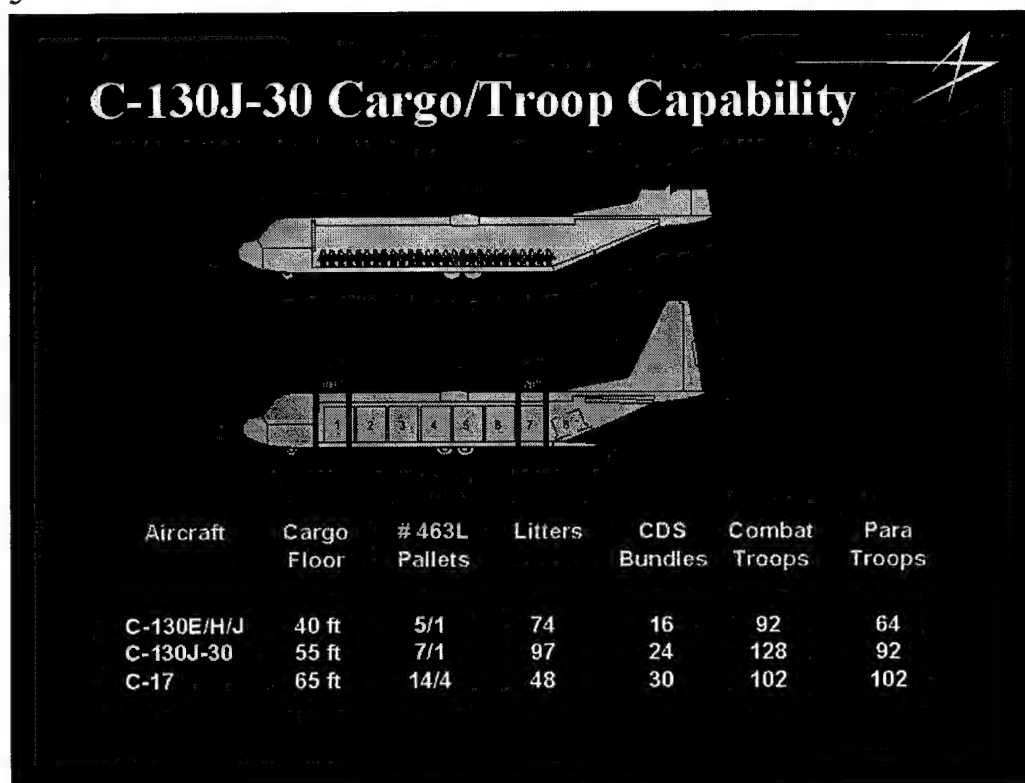
airdrop, a role that it has proven poorly suited for. The J-30 is also designed with survivability in mind, sporting a high-speed ramp (250 KIAS) and the latest in defensive systems to protect it during combat aerial delivery.

How the J-30 Stacks Up

As previously recognized, the C-17 is the premier airlifter in the US inventory, and any future airlift acquisition will most certainly draw comparisons. Although the J-30 is not a completely “new” airlifter without a proven history, it is a radical departure from the traditional Hercules. With new engines, composite six-bladed props, advanced avionics and mission computers, head-up displays, and a 35 percent reduction in crew complement, the J-30 provides the latest and greatest in technology. Also, reconfiguration times have shown man-hour savings as high as 90 percent over previous C-130 models. This will represent dramatic reductions in turn-around times.

The J-30 does provide some benefits over the C-17, as shown in Figure 5. First, it can carry more combat troops and has an unrefuelable range of 3000 nautical miles, 600 greater than the C-17. Second, it is a superior Aeromedical Evacuation platform, capable of carrying 97 litter patients, more than any other military transport. Third, it is capable of airdropping personnel at lower altitudes, in smaller formation geometry, and is considered a front-runner to replace the C-141 as the primary platform for Strategic Brigade Airdrop (SBA) (23:5).

Figure
5



. Cargo/Troop Capability Comparison (10:10)

Projected Savings

The J-30, at \$55 million a copy is \$125 million less than a C-17, but considerably more than its predecessor, the C-130H. Although the purchase of the J-30 incurs large

up-front costs, over the long run we realize significant savings when weighed against the cost of operating and maintaining 30-year old airplanes. In Table 3, the dotted line displays the escalating cost of ownership if we maintain the status quo in our C-130 fleet. The dark shaded area on the left represents costs related to acquiring 150 J-Models. The next shaded area under that, on the far right, represents approximate future costs if we purchase the J-Model and modernize the remainder of our C-130 fleet.

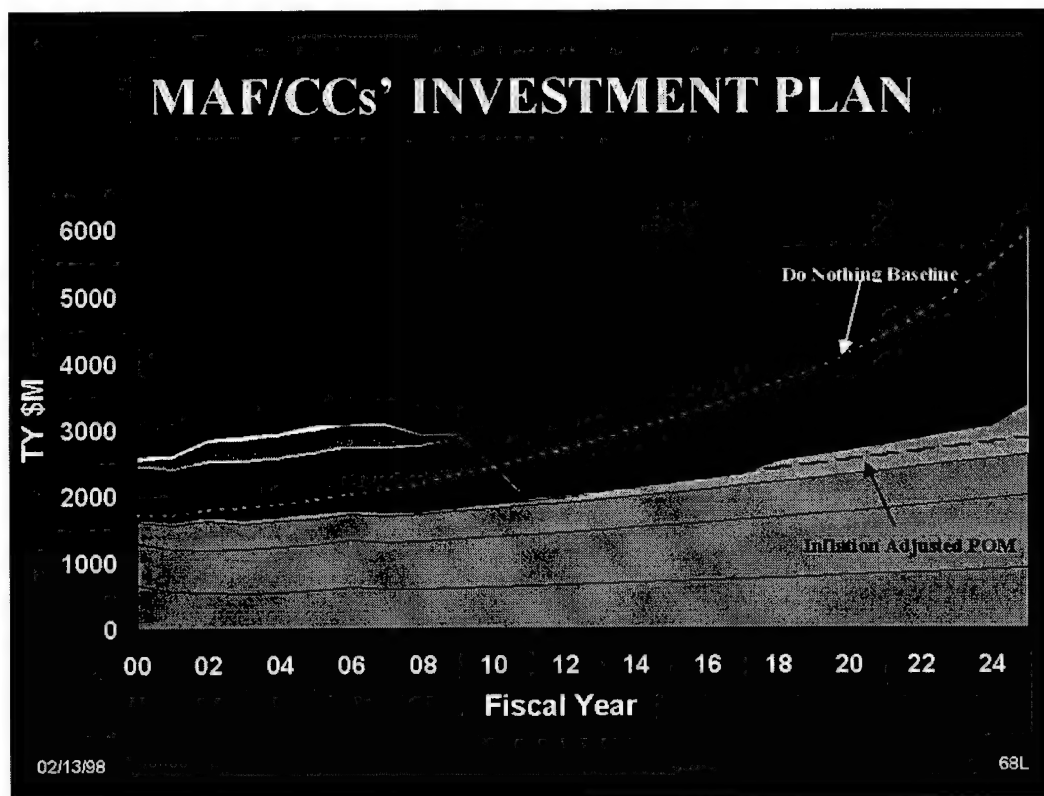


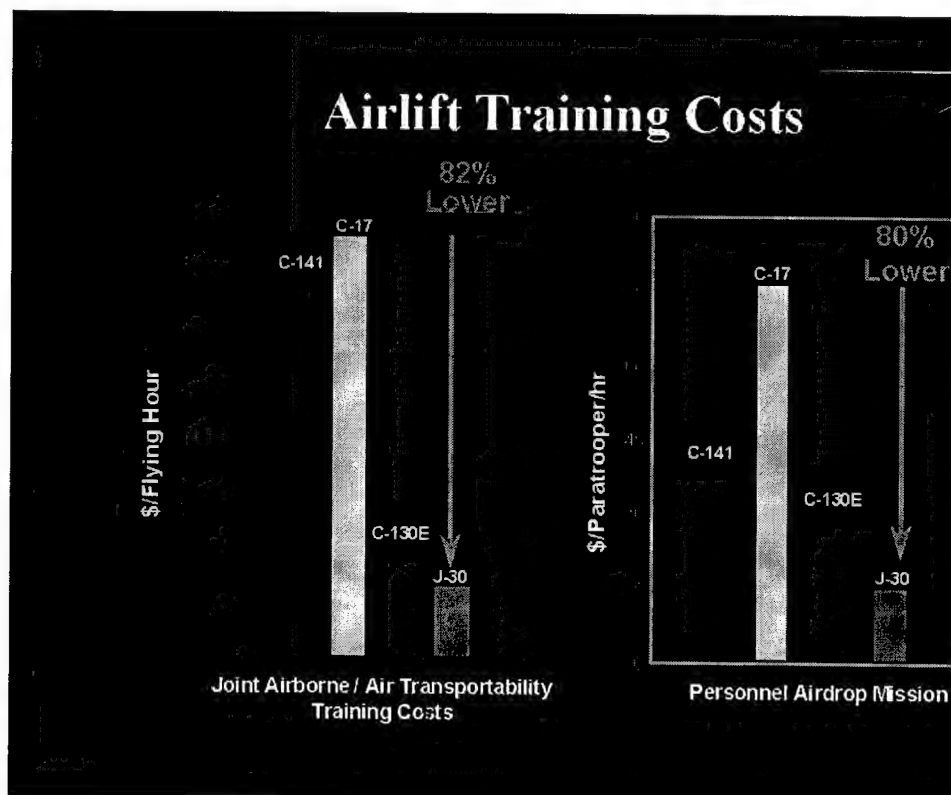
Figure 6. Projected Costs of C-130 Modernization (1:68)

The J-30 offers considerable fuel savings over the C-17. Consider that the J-30 burns 4200 pounds of fuel per hour while the C-17 burns 20,000 pounds per hour. On a

2400 nautical mile mission, the J-30, at a cruise true airspeed of 340 knots, will complete the trip in about seven hours, burning 29,400 pounds of fuel. The C-17 on the other hand, at an airspeed of 450 knots, will cover the same distance in 5.3 hours burning 106,000 pounds of fuel. For missions that do not demand the outsize capability or heavy lift capacity of the C-17, this represents considerable savings (13:35). Operational costs for the J-30 are also considerably lower than for the C-17. For Joint Airborne Training, the J-30 flying hour cost is \$1,050 while the C-17 flying hour cost is \$7,765. If both aircraft were performing personnel airdrop training with maximum jumpers (102 for the C-17, 92 for the J-30) the C-17 would cost \$76.11 per jumper while the J-30 would cost \$11.41 per jumper, 80 % lower. Figure 7 shows the difference in cost for Joint

Airborne/Air Transportability Training between the J-30 and AMC's other personnel airdrop assets (10).

Figure 7. Joint Airborne/Air Transportability Training Cost Comparison. (10:13)



VI. Recommendations

Option 1

The scenario supported by current doctrine, AMC's Tiger Team, and the traditional perceptions of C-130 employment supports maintaining the status quo, which says employ the J-30 as a tactical, intratheater airlifter. Theater CINC's also support this application in order to maintain control of airlift assets within their theater of operations. The C-130 has a solid record as an intratheater airlifter and the J-30 provides more cargo capacity, greater range, increased speed, and the latest in safety technology to meet the stringent navigation capabilities mandated by GATM. Also, the J-30 offers many of the advantages that the C-17 provides, like less maintenance, smaller crew compliment, and quicker turn-around time. With a smaller logistical tail than the current fleet of C-130s, future savings over cost of ownership will pay for the increased up-front purchase costs. These advantages will also relieve theater CINC's of some of the other burdens of ownership that currently hamper day-to-day operations. Replacing the older E and H-model C-130s with the J-30 would rid the Air Force and the theater CINC's of the less reliable models in the inventory. The J-30 would certainly address the modernization concerns addressed by the Tiger Team.

This may also be the best option because it keeps the C-130 fleet dedicated to the tactical US Army peacetime airdrop requirements. Historically, strategic aircraft have performed a sizable age of the Army's airdrop training events. Efforts to increase this effort have been unsuccessful either because these aircraft were needed for strategic

events, or they have been unable to perform the tactical missions within the Army's constraints (21:44). Because the low-level flying that accompanies these types of missions places the greatest stress on airframes, using J-30s in place of C-141s might help extend the service life on the C-141 fleet.

However, the surplus of C-130 assets does not support the need to acquire the J-30 for intratheater airlift or for airdrop training. General Kross noted the inordinate amount of Operations and Maintenance (O&M) appropriations that go toward airdrop training and questioned the number of training bundles being dropped to keep all the C-130 crews qualified. His observation was that the C-130s needed to drop fewer training bundles and fly more Transportation Working Capital Fund (TWCF) missions that generate revenue for AMC (14).

When General Fogleman cited an overabundance of theater airlift assets, he opened the door for a reduction in the number of C-130s worldwide, with a proposed retirement of 60 airframes. However, with the projection by the GAO that we will acquire the J-30 on a one-for-one basis, it opens the door for options other than the traditional tactical theater airlifter.

Option 2

If we truly have an overabundance of C-130s available for current intratheater airlift demands, what would happen if we acquire the J-30 to shore up our projected intertheater shortfalls? First, we could introduce the J-30 into the strategic flow, assigning it to fly more TWCF generating missions. Second, we would be able to reduce

training costs associated with keeping aircrews proficient and alleviate some of the drain on O&M money.

Funding is not the only place there are opportunities for potential savings. With the J-30 flying more strategic missions, AMC may be able to extend the life of the C-141. Acquiring the J-30 at a faster rate could help fill the bathtub and provide the additional "tails" for the intertheater missions. Lockheed-Martin has also indicated a willingness to come down below \$50 million per airplane on the initial cost of the J-30 if the USAF will commit to a significant number now (10:1). This will provide them some security over future production. More importantly, this kind of commitment would also serve to secure greater foreign sales. Lockheed has already received consideration for more deliveries to nations who already fly the C-130. Historically, USAF commitment to buy weapon systems acts as a catalyst for increased foreign sales. What these other nations understand is that American acquisition represents logistics support worldwide, reducing their logistics tail and support costs. They also realize that the purchase price of future models will more than likely be reduced.

Although this option has some benefits, recent studies indicate that inserting the J-30 into the strategic flow of a contingency will actually reduce our capability by seven tons per J-30 introduced (11). The limiting factor is not aircraft, but MOG and resources necessary to handle the flow of airplanes and cargo. This limitation has serious implications for option two and leads into an examination of the impact of operating the J-30 in a mixed role. However, this did not take into account direct delivery and the

J-30's ability to circumvent the MOB for the FOB. This added benefit, if properly utilized, would actually reduce the demand on resources at the hub and create more flexibility for the theater CINC on how to best utilize his "owned" intratheater assets. The J-30's ability to deliver directly to the front-line badly needed food and ammunition might just be the perfect reason to task it as an intertheater airlift asset.

Option 3

This is the best employment option for the J-30. Determining the proper mix of J-30s dedicated as intratheater assets versus intertheater assets will be the challenge. This employment option is not a radical departure from the early history of C-130 employment. The responses to crises in the Middle East and Taiwan in 1958 challenged the C-130 with both intertheater and intratheater taskings.

Current Air Force plans indicate that the basic missions of the J-30 will not differ greatly from past C-130 applications, but will be expanded. Because the J-30 offers more pallet positions and is able to haul greater numbers of combat personnel and paratroopers than previous C-130 models, it could be used to augment intertheater missions, like strategic brigade airdrop (23:5). The J-30 will be used strictly for the personnel airdrop portion of SBA, while the C-17 airdrops the equipment. Studies show that we will require 77 J-30s to perform SBA. Using a pessimistic reliability rate for the J-30 of 90% (current C-17 reliability rate is 96%), the Air Force would have to provide 86 J-30s to perform SBA (13:38). The remaining 64 J-30s will now be available for other intertheater missions as well as intratheater missions. As discussed in option 1, the J-30

will provide theater CINCs with increased flexibility. However, as in option 2, this would also allow AMC to utilize the J-30 for TWCF generating opportunities.

VII. Conclusion

The end of the Cold War has had a dramatic effect on America's national security strategy. As the peace dividend continues to yield defense cuts and force reductions throughout the world, we have moved from a forward presence force to a force projection force. Airlift is vital as a first response to any action that requires a military response. Whether it involves airlifting supplies and personnel into Bosnia in support of IFOR or enforcing sanctions on Iraq, adherence to AMC's Core Competency of Global Reach will continue to place demands on our airlift resources. This demand must be met with a well thought-out employment strategy for all of AMC's airlift assets.

The harsh reality is that the future indicates that our airlift assets will experience shortfalls in capability, creating challenges for any transportation system we build. This shortfall appears in two ways. First, it appears in the bathtub depicted in Figure 1, showing that under the worse case scenario of two MTWs we fall short of the target 49.7 MTM/D. Second, it shows up in the dramatic loss of 146 tails as we retire the C-141 and bring the C-17 force up to strength. Unfortunately, none of the studies on airlift capacity examine the number of tails required to meet this demand and this is beyond the scope of this paper. An examination of the number of missions required is a research paper in itself in which the J-30 would have to receive some consideration as an intertheater asset. Whatever the case, we will be forced to look for innovative ways to shore up these assets in order to maintain the capability to react to any contingency that places excessive demand on airlift resources.

This paper has looked at how we might best employ the C-130J-30 to augment intertheater airlift. The C-130 has proven itself a versatile airlifter, capable of performing a variety of missions, involving intertheater and intratheater airlift. From resupply airdrop missions to An Loc and Khe Sanh to intercontinental transport of personnel and supplies to Lebanon and Taiwan, it has served our nation and others well. The J-30, with its greater range, increased speed, extended cargo compartment, and projected savings in personnel and support costs promises to maintain that tradition of service and creates several employment options. Each option has aspects that will help overcome the shortfalls that exist within our strategic airlift force.

However, other than for SBA, there are several reasons why the J-30 will never seriously figure into the intertheater airlift picture. First, political realities show that Congress will add J-30s to the defense budget without pressure from Air Force Leadership. This works to the Air Force's advantage as they fight for funding from the ever-shrinking defense budget. The Air Force can continue to appear apathetic toward acquisition of the J-30 and still upgrade its intratheater airlift assets. As long as Congress is willing to fund expensive pork projects like the C-130, the USAF will be able to modernize its C-130 force without jeopardizing other valuable defense acquisition projects like the C-17. If in the end these pork projects take away from acquisition of the C-17, the Air Force may be forced to look at ways to integrate the J-30 into the strategic flow.

Second, the intratheater role is still the domain of the C-130. The J-30 provides greater capability within the realm of intratheater airlift. Also, theater CINCs, supported

by the classified information in the SECDEFs Defense Planning Guide (DPG), are unlikely to relinquish control of the only airlift they "own" (20). The tactical training role performed by the C-130 will also continue, partly as a result of recommendations from the Tiger Team. Additionally, the Army's requirements and failures of other aircraft to adequately support these requirements justify keeping the C-130 force airdrop qualified.

Finally, intertheater airlift shortages serve to reinforce the Air Force stance that additional C-17s, beyond the initial buy of 120, is the only way to overcome these shortfalls. Irresponsibly targeting the J-30 as an intertheater airlifter would only undermine this position.

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Vita

Major Douglas L. Haven was born on 9 June 1961 and raised in Kalispell, Montana. He graduated from Flathead High School in 1979 and attended North Idaho College on a music scholarship. In 1982 he attended the University of Idaho and graduated in May of 1986, receiving his commission in the United States Air Force through ROTC. He completed a Master of Science degree in Operations Management from the University of Arkansas in 1994.

After graduation from Specialized Undergraduate Navigator Training at Mather AFB, California, he was assigned to fly C-130s with the 17th Tactical Airlift Squadron at Elmendorf AFB, Alaska. In 1991 he followed on to Little Rock AFB, Arkansas as an Instructor/Evaluator Navigator for the 62nd Airlift Squadron, followed by a year as the 314th Operations Group Evaluator Navigator. In October of 1994 he was selected to represent the USAF as an Exchange Officer to the Royal Australian Air Force, RAAF Base Richmond where he served as an Evaluator Navigator and Assistant Flight Commander with 36 Squadron. He was then selected by Air Mobility Command to attend the fourth class of the Advanced Studies in Air Mobility.

Permanent Address: 15620 Andover Heights Drive
Woodbridge, VA 22192